

Non-Load-Test Sling Request Form

REVISION LOG

REV	DESCRIPTION	DATE
Basic	82K10131-1 Li-Ion Battery Adapter Plate Lifting Fixture	05/11/2015

APPROVALS

TITLE	NAME	ORG	SIGNATURE	DATE
TOSC Mechanical Design Engineer	Daniel McGrath	TOSC	Daniel McGrath	05/20/2015
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NASA S&MA	Kevin Mellett	NASA	Kevin Mellett	20 May 15
TOSC Safety	Joseph Degano	TOSC	Joseph D. Degano	27 MAY 15
NASA UB PM	STEVE BIGOS	NASA	Steve Bigos	5/27/15
NASA Mechanical Engineer	Kimberly Simpson	NE-M1	Kimberly L. Simpson	5/27/15

SLING INFORMATION

SLING NAME: Li-Ion Battery Adapter Plate Lifting Fixture	
PMN: GH5-01351	S/N: 001
OTHER IDENTIFIER (e.g. DWG #): 82K10131	
DATE OF REQUEST: 05/11/2015	REQUESTING ORG: TOSC Mechanical Design (5400)

NOTE:

The NASA Lifting Standard, NASA-STD-8719.9, paragraph 10.3.3, allows for non-load test slings as follows:

10.3.3 Non-Load Test Slings. Due to unique design and usage requirements, a sling may be designated as a non-load test sling by the LDEM, with concurrence from the affected/responsible program/project office, the responsible safety, design engineering, systems engineering, operations, and maintenance organizations. Such slings do not require periodic load tests. Inspections shall be conducted in accordance with paragraph 10.4. This non-load test designation shall be formally documented by each installation and the sling marked accordingly to designate it as a non-load test sling.

DESCRIPTION OF THE PERIODIC LOAD TEST THAT WILL NOT BE PERFORMED

This request is to not perform the periodic load test for the 82K10131-1 Li-Ion Battery Adapter Plate Lifting Fixture; reference paragraph 10.3.2 of the NASA Lifting Standard, NASA-STD-8719.9.

10.3.2 Periodic Load Testing.

Slings shall undergo periodic load test at least every 4 years at a specific load test factor of the design rated load as given in Table 10-3. All components shall be load tested as a system, if practical. Slings used for critical lifts shall be load tested at least once per year. Slings used infrequently for critical lifts shall be load tested before each critical lift if it has been over a year since the last load test. Lifting interfaces such as eyebolts, D-rings and lifting lugs permanently attached to the load are exempt from periodic load testing.

NOTE: The 82K10131-1 Li-Ion battery adapter plate lifting fixture will be deemed a non-load test sling, in accordance with paragraph 10.3.3 of the NASA Lifting Standard. Such slings do not require periodic load tests. Inspections will be performed in accordance with paragraph 10.4 of the NASA Lifting Standard.

SLING DESCRIPTION

General: The 82K10131-1 Li-Ion battery adapter plate lifting fixture is composed of the following components:

1. A three legged structural sling (82K10131-2) weldment fabricated at KSC from 304L stainless steel rectangular tubing and plate.
2. A three legged wire rope bridle sling rated for lifting 1.7 tons at 45 degree sling angle.
3. Seven Crosby 5/16 turnbuckles rated at 800 lb capacity each.
4. Four swivel hoist rings rated at 550 lb each.

The 82K10131-1 Li-Ion battery adapter plate lifting fixture will be attached to a crane or hoist via the master link of the bridle sling and will be used exclusively to lift the 684-017050-0001 Li-Ion battery adapter plates into place on the HTV EP carrier which will be mounted on a raised rotation table at JAXA. The Li-Ion battery adapter plates weigh 85 lbs and the 82K10131-1 sling will be used to lift them into place approximately 15 feet from the floor level. Figure 1 shows the configuration of the lifting fixture to the adapter plate.

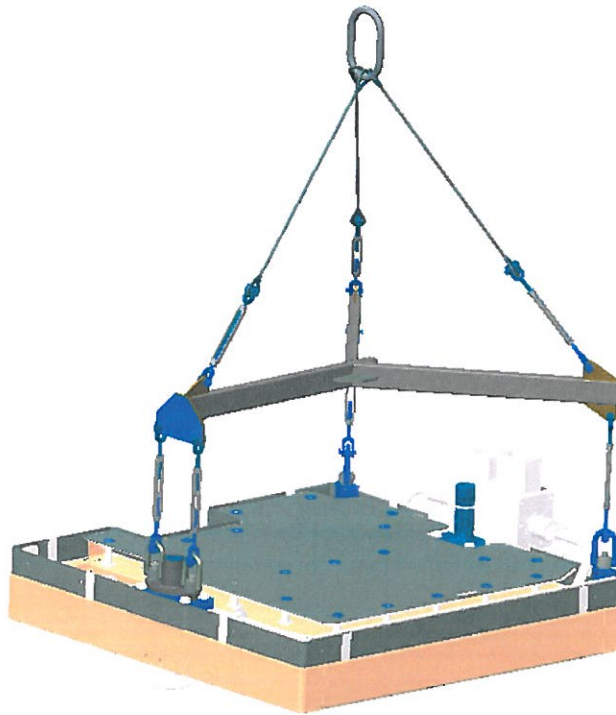


Figure 1: Lifting Fixture attached to Li-Ion Battery Adapter Plate.

Design Standards: The following standards governed the design of the 82K10131-1 Lifting Fixture:

SSP 50004, Ground Support Equipment (GSE) Design Requirements, International Space Station Program
 NASA-STD-8719.9, NASA Standard for Lifting Devices and Equipment

SLING DESCRIPTION**Design Factors:**

The analysis of the design of the 82K10131-2 Structural Sling is published in report KSC-TOSC-13412. The following design factors were used in the analysis: 5 against ultimate strength, 3 against yield.

The Margin of Safety versus the yield design factor of 3 for the structural sling is +7.23, and the Margin of Safety versus the ultimate design factor of 5 is +9.23. Margins of Safety are defined as follows:

$$MS_{yield} = \text{material yield strength} / (SF_y * \text{maximum stress}) - 1$$

$$MS_{ult} = \text{material ultimate strength} / (SF_u * \text{maximum stress}) - 1$$

The purchased components of the lifting fixture (bridle sling, turn-buckles, swivel hoist rings) have rated capacities that were assigned by their manufacturers in compliance with NASA-STD-8719.9 (Design Factors of 5 ultimate and 3 yield, and proof loaded at twice the rated load minimum). None of the purchased components are loaded above 11% of their rated capacity.

Material/Construction Properties:

The 82K10131-2 Structural Sling will be welded 304L rectangular tubing and plate. The welding will be per AWS D17.1 / AWS D1.6 using 308L filler and will be dye penetrant inspected after fabrication and proof load.

The bridle sling consists of a ½" alloy steel oval master link and three 20 inch legs made from ¼" 6x19 wire rope and thimble end fittings.

The Crosby turnbuckles are normalized steel and galvanized for corrosion protection which meet or exceed ASME B30.26 requirements.

The swivel hoist rings are forged steel, black oxide finish, and meet OSHA standards and Military Specification MIL-STD-1365(11) or MIL-STD-209C

SLING USAGE**Operational History:**

New Sling

Maintenance History:

New Sling

Test History:

The 82K10131-1 Lifting Fixture Assembly will be proof loaded to 200% of rated load (250 lbs) prior to delivery.

Sling Rated Load versus Actual Load:

The sling will be rated at 125 lbs (safe working load), but will be used to lift 85 lbs.

SLING USAGE**Storage Provisions:**

The 82K10131-1 Li-Ion battery adapter plate lifting fixture will be stored in a climate controlled facility when not in use.

Planned Future Use:

The 82K10131-1 Li-Ion battery adapter plate lifting fixture will be used at JAXA to prepare the Li-Ion Battery for flight.

RATIONALE FOR NON-PERFORMANCE

- The lifting fixture has been designed with very high Margins of Safety, it will be proof loaded to 200% of its safe working load, and it will be used to lift loads well below its rated capacity.
- The lifting fixture is specifically designed for and used exclusively to lift Li-Ion battery adapter plates.
- The lifting fixture will be stored in a climate controlled facility when not in use.
- Inspections will be performed in accordance with the NASA Lifting Standard, including a visual inspection before each use.

Describe the risks, if any, of not performing the load test and how they will be mitigated:

There is no additional risk by not performing the periodic (annual load test). The 82K10131-1 Li-Ion battery adapter plate lifting fixture will be proof loaded well above the minimum requirement for its actual usage. Any defects that might affect the performance of the sling will be detected via annual and procedural inspections, including before each use, which will still be required in accordance with the NASA Lifting Standard.